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FOREST PEST MANAGEMENT



STATE & PRIVATE FORESTRY

DOUGLAS-FIR TUSsock Moth¹ MONITORING IN SOUTHERN IDAHO DURING 1983

by

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ABSTRACT

Douglas-fir tussock moth populations have increased in the Owyhee Mountains of southwestern Idaho since 1980. Defoliation was extensive in 1983 but, according to egg mass surveys, the population has since collapsed and little defoliation is expected in 1984. This report presents results of a 1983 aerial detection survey, larval survey, early detection survey using pheromone-baited traps and an egg mass survey.

INTRODUCTION

Douglas-fir tussock moth (DFTM) populations are characterized by rapid increases and resultant serious defoliation of host trees; Douglas-fir, grand fir, subalpine fir, and spruce. Because populations increase rapidly, Daterman et al. (1979) and Mason (1979) developed methods to quickly and accurately detect and monitor population buildups well before significant defoliation occurs. This gives the land manager sufficient time to assess and implement management alternatives.

Surveys conducted in 1980 and 1981 indicated that DFTM populations were increasing in the Owyhee Mountains of southwestern Idaho (Thier 1982). In 1981 aerial surveys identified approximately 160 acres of DFTM defoliation (Forest Pest Management 1981), and in 1982 the population expanded and defoliated approximately 4,000 acres of Douglas-fir (Thier 1983).

In 1983, we conducted aerial and ground surveys to detect defoliation, quantify population levels and evaluate potential for DFTM population growth. Information from these surveys is reported here.

METHODS

Aerial Detection Survey

Tree defoliation by DFTM was recorded during the annual aerial detection survey conducted in August 1983. Aerial survey methods were similar to those described

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by Pettinger (1979).

Larval Survey

In June 1983 we used Mason's (1979) lower crown sequential sampling methods to survey first and second instar larval DFTM populations at four sites on the Payette National Forest: Adams Creek, East Fork Brownlee Creek, Fourbit Creek, and Olive Creek (Figs. 1, 2, 3). We sampled these particular sites because they averaged over 25 DFTM per trap during the 1982 early detection survey (Thier 1983). Catches of this magnitude indicate that a population may cause visible defoliation within the next two summers (Daterman et al. 1979).

Additionally, we surveyed outbreak level DFTM populations in 11 stands in the Owyhee Mountains for a possible research pilot control project. Since we did not have time to quantify midcrown outbreak level larval populations according to accepted methods (Mason 1979), we estimated midcrown DFTM population densities of first and second instar larvae using a lower crown method similar to that presented by Mason (1977). We computed the mean number of DFTM larvae collected from three branch samples from each of 32 to 100 trees in each stand. Mean lower crown larval counts were then multiplied by 2.04 to estimate midcrown population densities. This multiplier represents the ratio of midcrown population density to lower crown population density (Mason 1977).

Early Detection Survey

During late summer and fall, 1983, we conducted an adult DFTM early detection survey employing pheromone-baited sticky traps at 24 locations on the Boise, Payette, Salmon, and Sawtooth National Forests and adjacent state and private lands (Figs. 1-13). We chose trap locations where DFTM had been recovered previously (Thier 1983) but was not causing noticeable defoliation or areas suggested by land managers. Using the procedures outlined by Daterman et al. (1979), pheromone-baited traps, obtained from the USDA Forest Service Methods Application Group, were placed at each location between August 11 and 19 and retrieved between October 17 and 26. Trapped moths were identified and the average number per trap computed. Data were then interpreted according to Daterman et al. (1979).

Egg Mass Survey

In mid October, 1983, we evaluated DFTM egg populations at nine sites in the Owyhee Mountains. We employed the methods presented by Tunnock and Livingston (1974) to determine population potential for this outbreak level population in 1984. Because of difficult access these sites were not necessarily located in the same stands we sampled for larvae.

RESULTS AND DISCUSSION

Aerial Detection Survey

Approximately 14,200 acres of host tree defoliation, all confined to the Owyhee Mountains, were noted in 1983 (Fig. 13). This was more than a three-fold increase over 1982 levels. Tree defoliation on approximately 2,855 acres was categorized as light, 4,065 acres as moderate, and 7,280 acres as heavy. This

expansion was predicted (Thier 1982) and is seemingly typical of DFTM outbreaks in the Owyhee Mountains (Moyer 1976; Parker 1971, 1973; Parker et al. 1972; Forest Pest Management 1981; Thier and Hoffman 1982).

Larval Survey

Mason (1979) defined midcrown larval DFTM levels to describe larval population densities and results of larval surveys. Levels were defined as low, suboutbreak, and outbreak. At the low level there is less than 1 early larva per 1000 inch² of foliage, and there is no chance of an outbreak for at least two years. At the suboutbreak level, there are between 3 and 20 early larvae per 1000 inch² of foliage, and the DFTM population has the potential to attain outbreak levels in the next generation. Lastly, at the outbreak level there are over 20 early larvae per 1000 inch² of foliage and visible defoliation results.

Larval populations at all four sample sites on the Payette National Forest-- Adams Creek, East Fork Brownlee Creek, Fourbit Creek and Olive Creek-- were categorized as low level and visible defoliation in 1984 is not expected.

The results of our larval assessment in the Owyhee Mountains are contained in Table 1. As stated in the Methods section, midcrown population densities were based on lower crown sample data. A low level population was found at Boone Peak 1 and consequently no defoliation was observed around the sample area in 1983.

We found suboutbreak level populations at Boone Peak 2, French Gulch 1 and 2, South Boulder Creek 2, and Vulcan Gulch 2, 3, and 4. Visible defoliation, ranging from moderate to heavy, was observed at these sites in 1983. This suggests that the correlation between lower and midcrown larval densities varies from Mason (1977) or that threshold population densities described by Mason (1979) are too high for the Owyhee Mountains.

Lastly we identified outbreak level populations at Cottonwood Creek, Vulcan Gulch 1, and Washington Gulch. These three areas sustained heavy defoliation in 1983.

Early Detection Survey

Traps deployed at all 24 early detection survey sites contained adult moths (Table 2). At the majority of the sites where we have trapped before the average number of moths caught per trap was greater than was caught during previous years.

An average recovery of 25 or more DFTM per trap at a site indicates that a population may cause visible defoliation within the next two summers (Daterman et al. 1979). At 16 of our 24 sites including areas on the Boise, Payette, Salmon, and Sawtooth National Forests and State of Idaho lands, moth catches exceeded the indicative level of 25 moths per trap (Table 2). These findings indicate that spring larval assessments are needed to further quantify DFTM population levels and define population centers if suppression measures are contemplated.

Less than 25 moths per trap were recovered at eight sites. Noticeable defoliation should not be found in these areas in 1984.

Table 1.

Douglas-fir tussock moth larval survey - Owyhee Mountains, Idaho 1983

Area	Number of Trees Sampled	Lower Crown Larval Counts	Computed Midcrown Larval Density (# larvae/1000 inch ² foliage)	Larval Population Level	Defoliation Category observed during the 1983 Aerial Detection Survey
Boone Peak 1	50	0.18	0.37	low	none
Boone Peak 2	50	0.64	1.31	suboutbreak	light
Cottonwood Creek	77	73.2	149.33	outbreak	moderate
French Gulch 1	75	7.6	15.5	suboutbreak	moderate
French Gulch 2	75	4.99	10.18	suboutbreak	moderate
South Boulder Creek 2	100	2.45	5.0	suboutbreak	light
Vulcan Gulch 1	100	19.3	39.37	outbreak	heavy
Vulch Gulch 2	100	7.62	15.54	suboutbreak	heavy
Vulcan Gulch 3	32	3.2	6.53	suboutbreak	heavy
Vulcan Gulch 4	100	1.57	3.2	suboutbreak	heavy
Washington Gulch	100	39.8	81.19	outbreak	heavy

Table 2.

Summary of male Douglas-fir tussock moths
caught in pheromone-baited traps distributed in
southern Idaho - 1981 - 1983

Plot	Location			Mean Number of Male Douglas-fir Tussock/Moths/Trap by Year		
	Twp.	Rge.	Sec.	1981 ^{1/}	1982 ^{2/}	1983
<u>Boise N.F.</u>						
Anderson Creek Divide	14N	2E	14	1.2	0	11.0
Bear Creek	4N	10E	7	N.S. ^{3/}	0	32.8
Skunk Creek	12N	4E	14	0.2	0.6	29.0
Yellow Pine Creek	3N	10E	35	N.S.	0	10.6
<u>Payette N.F.</u>						
Adams Creek	14N	6W	23	N.S.	53.6	39.6
Barinaga Corral	20N	2W	23	N.S.	N.S.	44.2
Bear Saddle	15N	5W	31	N.S.	15.2	44.0
Brown's Pond	18N	4E	3	0	0.6	11.0
East Fork Brownlee Creek	16N	4W	3	N.S.	61.2	50.6
Fourbit Creek	13N	2E	7	N.S.	49.8	42.8
Little Weiser	13N	1E	1	N.S.	N.S.	25.6
McDowell Trail	17N	2W	17	N.S.	N.S.	35.8
Olive Creek	17N	2W	7	N.S.	36.8	51.2
Seid Creek	16N	4W	21	N.S.	N.S.	17.4
Stacy Creek	14N	6W	14	N.S.	N.S.	42.8
<u>Salmon N.F.</u>						
Arnett Creek	22N	20E	30	N.S.	0	0.6
Colson Creek	23N	16E	12	N.S.	15.2	39.0
Lick Creek	26N	22E	32	N.S.	7.6	38.4
Porphyry Creek	20N	18E	34	N.S.	0	4.6
<u>Sawtooth N.F.</u>						
Couch Summit	2N	14E	9	0.4	0	7.0
Little Water Gulch	3N	12E	7	3.8	13.6	27.0
Virginia Gulch	3N	11E	9	0.6	2.0	26.8
Warm Springs	4N	17E	14	N.S.	2.6	14.8
<u>Idaho State Lands</u>						
Sharps Canyon	2N	19E	36	19.4	16.2	41.2

^{1/} data from Thier 1982

^{2/} data from Thier 1983

^{3/} N.S. - not sampled

Egg Mass Survey

Results of the egg mass survey in the Owyhee Mountains are presented in Table 3.

Table 3. Douglas-fir tussock moth egg mass survey, Owyhee Mountains, Idaho, 1983.

Plot Location	<u>Number of Egg Masses</u>		Number of Cocoons
	Old	New	
Cottonwood Creek	2	0	6
Dewey Peak	35	1	113
Mill Creek 1	0	0	4
Mill Creek 2	1	0	6
New York Summit 1	13	0	37
New York Summit 2	25	0	28
Riley Gulch	0	0	43
South Boulder Creek 1	0	0	0
South Boulder Creek 2	0	0	8

Only one new egg mass was found in our survey of nine locations which indicates the population has collapsed, most probably due to a frequently noted nucleopolyhedrosis virus (Moyer 1976, Parker 1971). These data signal the end of the current defoliation cycle in the Owyhee Mountains. We suspect if any defoliation is noted in 1984 it will occur in small discrete areas.

RECOMMENDATIONS

We recommend that 1984 larval surveys be conducted around 1983 early detection survey sites which averaged over 25 moths per trap. Evaluation of larval populations will help locate and quantify the resident DFTM populations in and around these sites to identify potential outbreak areas. Further quantification will provide more information about the trend of these infestations and give land managers the facts needed to consider management alternatives.

Elsewhere, aerial detection surveys and early detection surveys will be continued as in 1983. These efforts will complement the DFTM monitoring efforts.

ACKNOWLEDGMENTS

G. Jensen and E. Ballard of the Salmon National Forest assisted with pheromone trap deployment and recovery.

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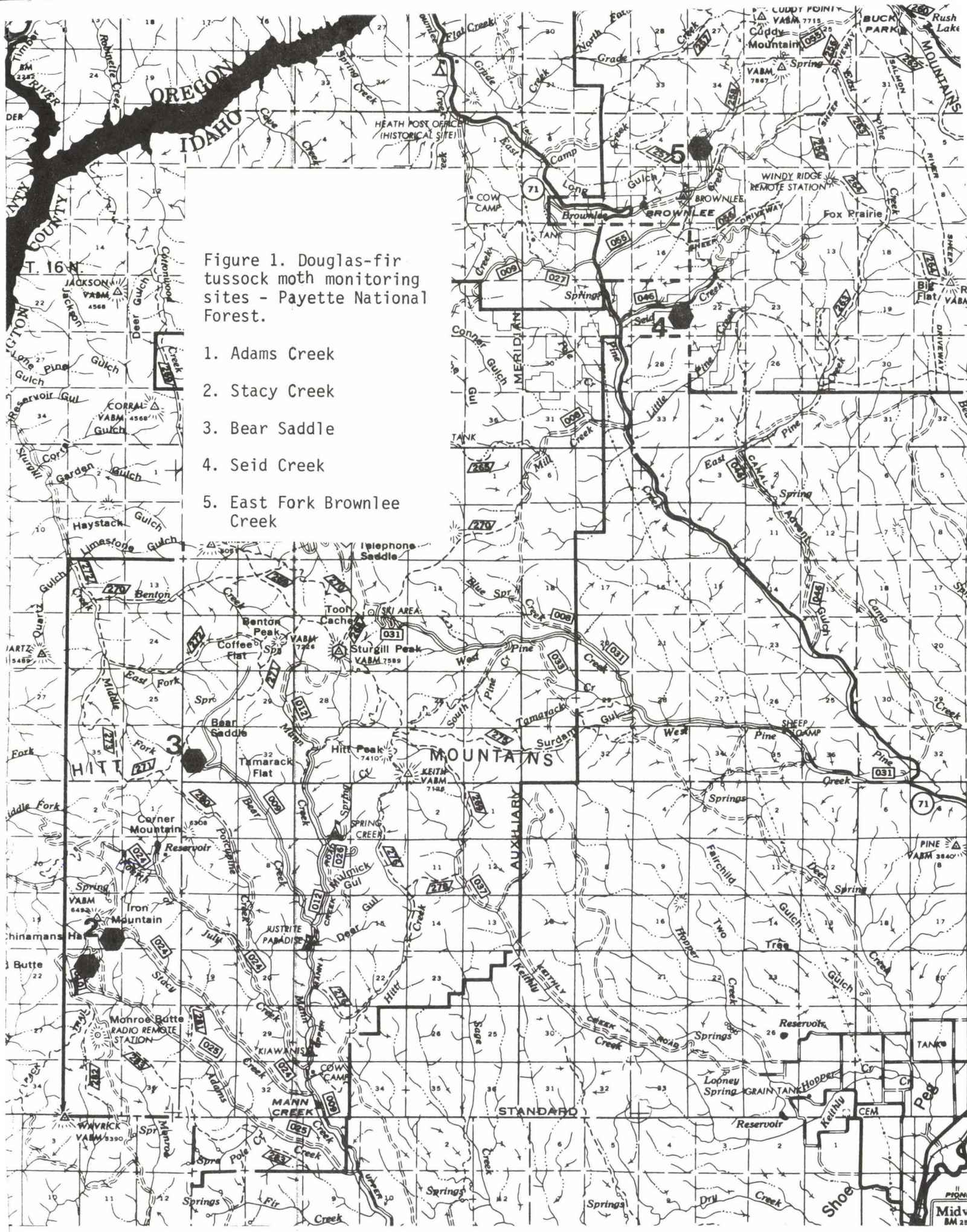


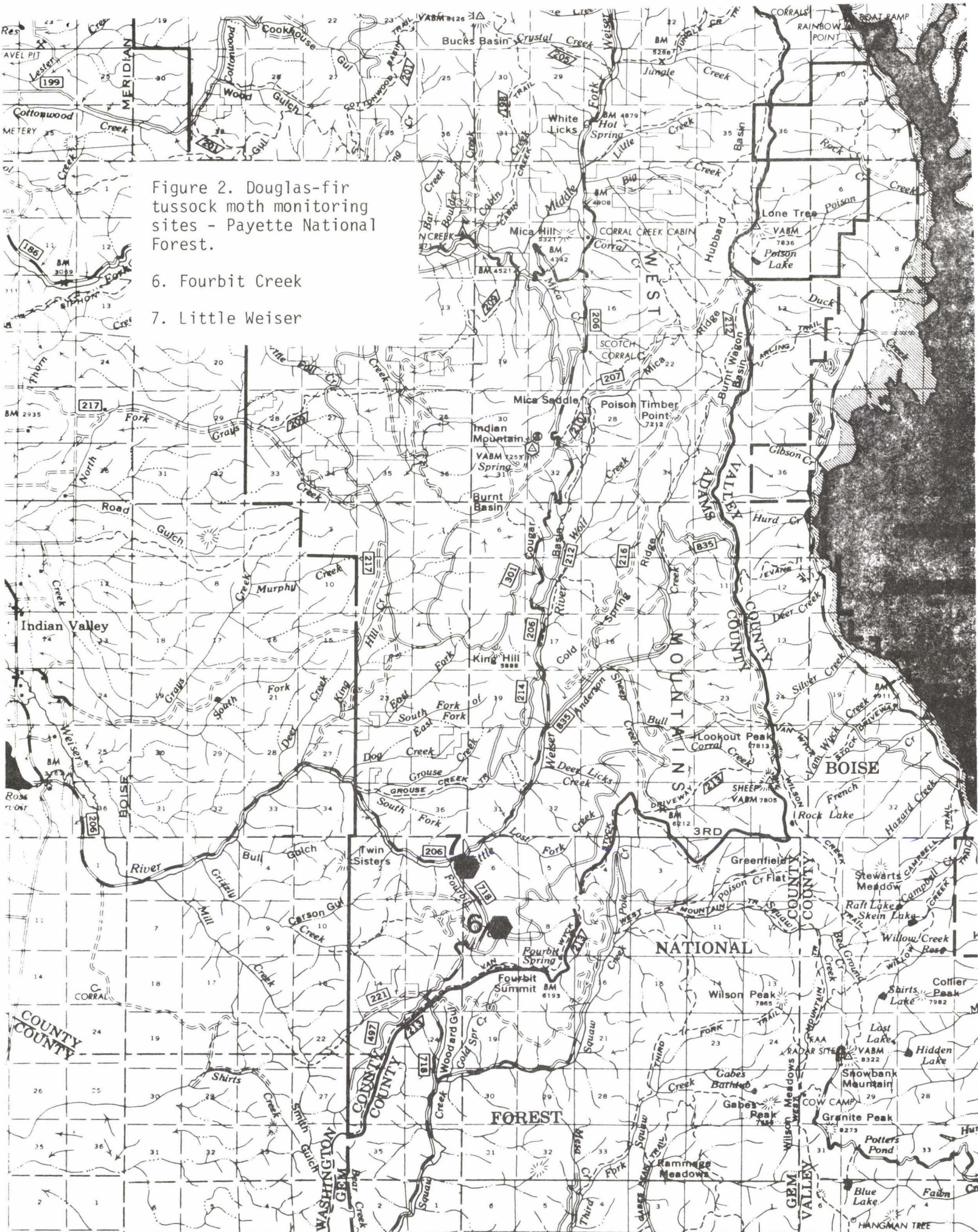
Figure 1. Douglas-fir tussock moth monitoring sites - Payette National Forest.

- 1. Adams Creek
- 2. Stacy Creek
- 3. Bear Saddle
- 4. Seid Creek
- 5. East Fork Brownlee Creek

Figure 2. Douglas-fir tussock moth monitoring sites - Payette National Forest.

6. Fourbit Creek

7. Little Weiser



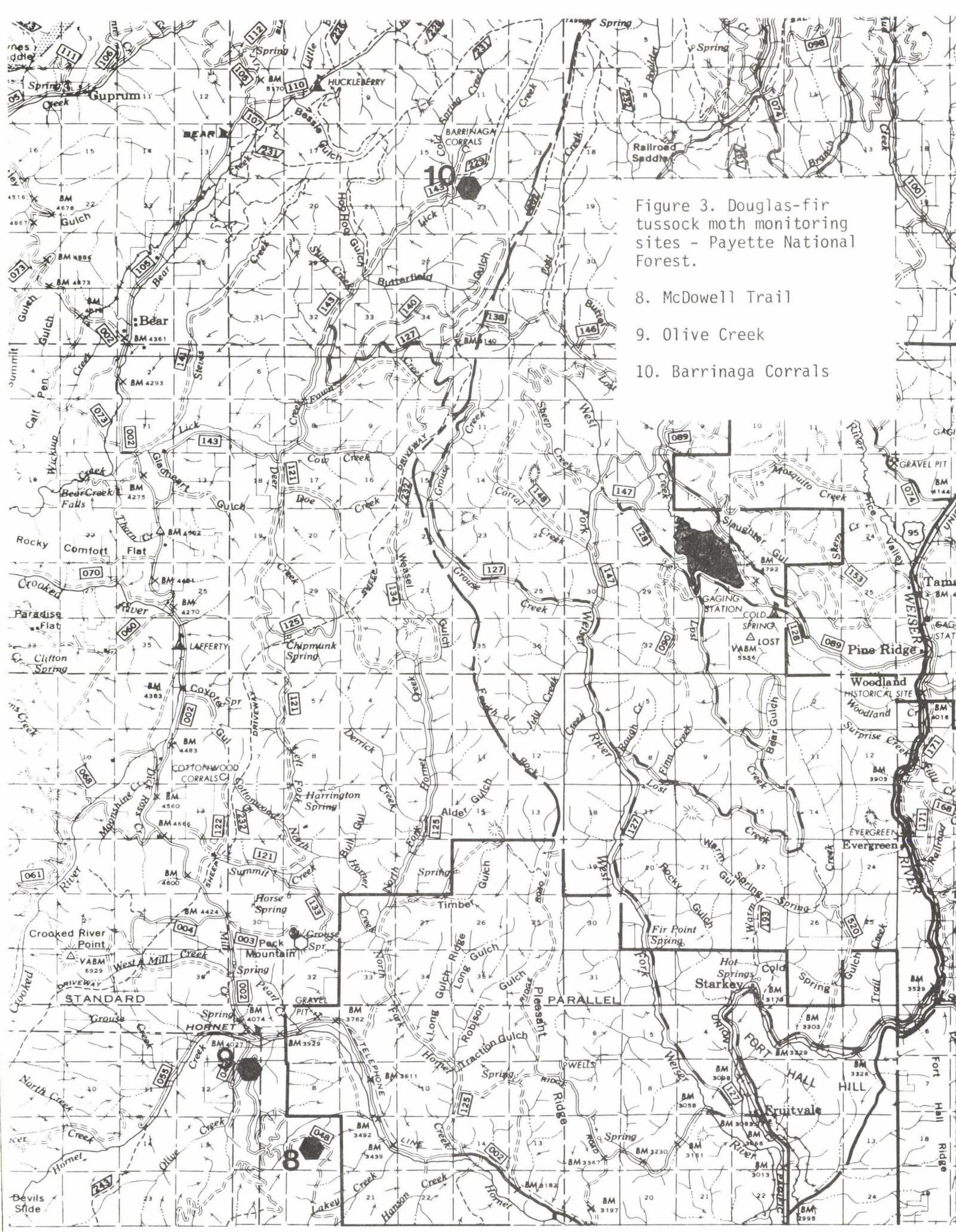


Figure 3. Douglas-fir tussock moth monitoring sites - Payette National Forest.

8. McDowell Trail

9. Olive Creek

10. Barrinaga Corrals

Figure 4. Douglas-fir tussock moth monitoring sites - Payette National Forest.

11. Brown's Pond

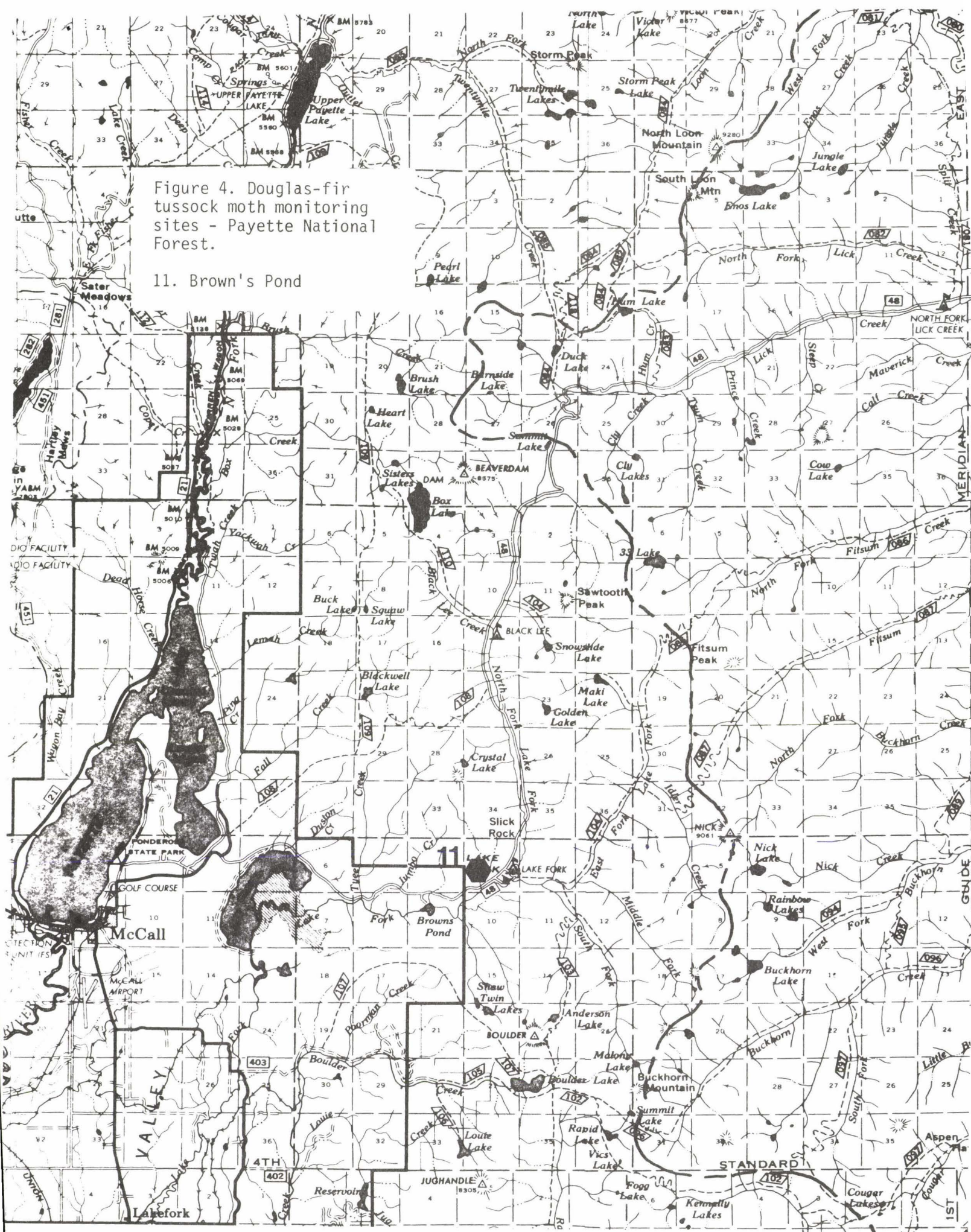
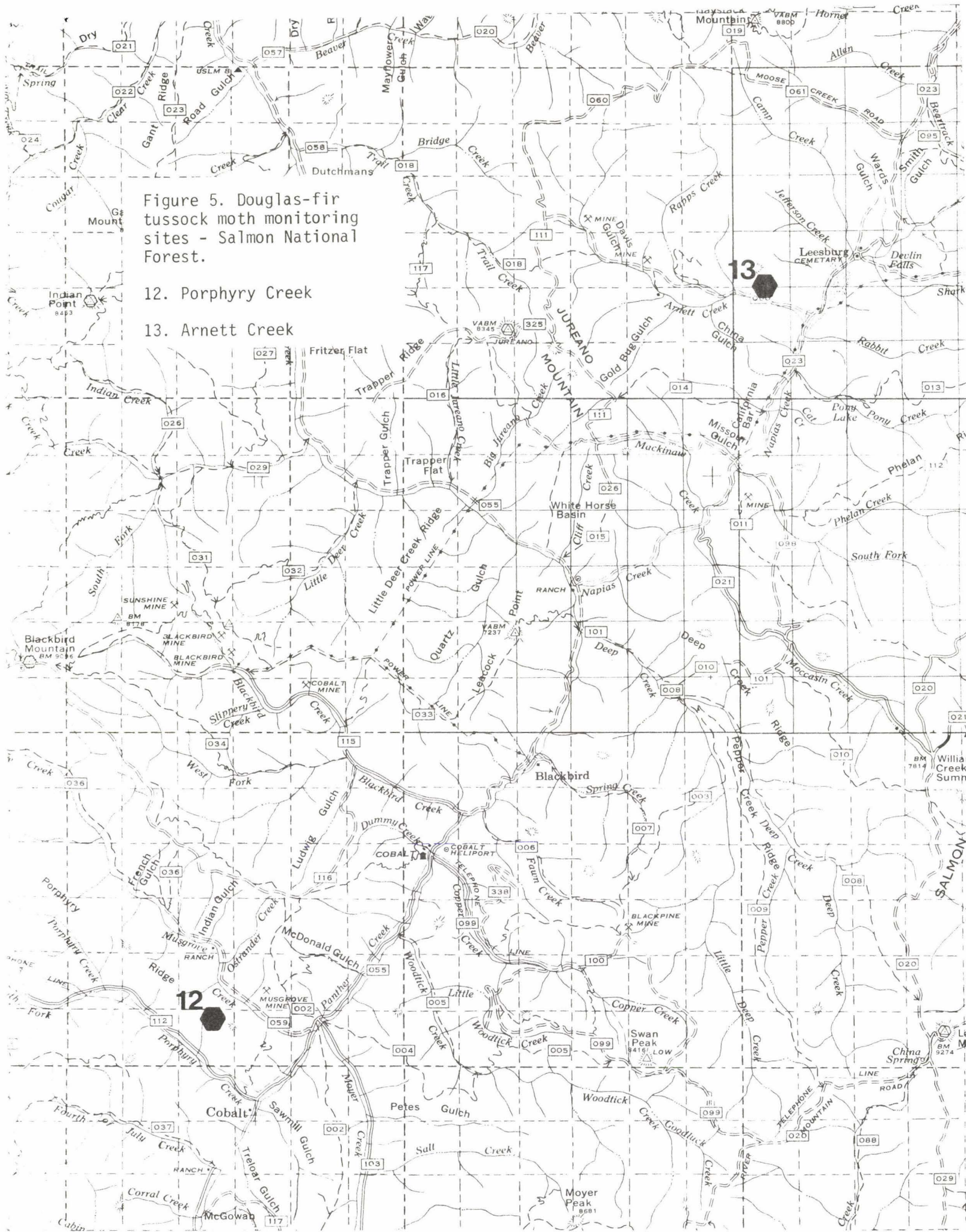


Figure 5. Douglas-fir tussock moth monitoring sites - Salmon National Forest.

12. Porphyry Creek

13. Arnett Creek



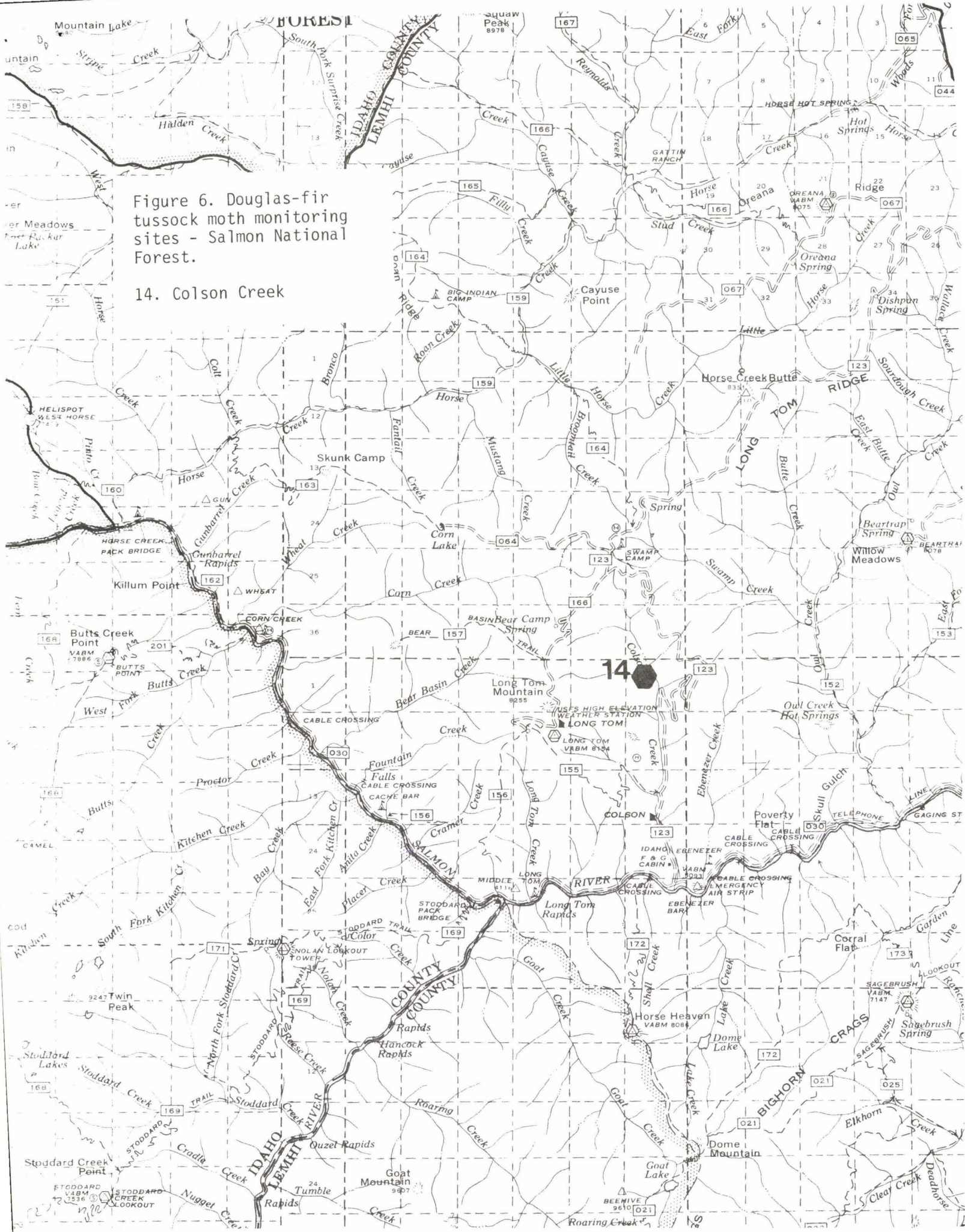
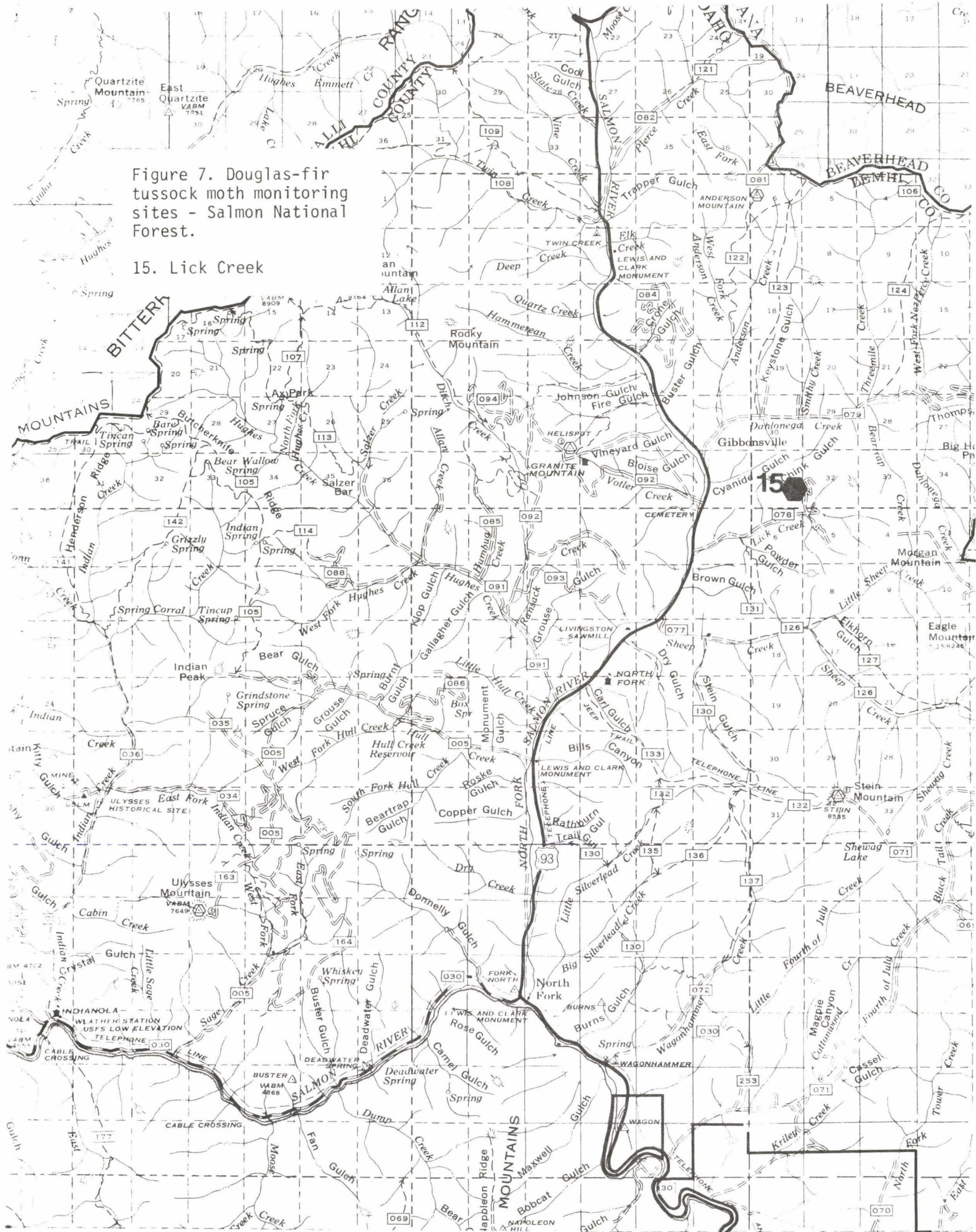


Figure 7. Douglas-fir
tussock moth monitoring
sites - Salmon National
Forest.

15. Lick Creek



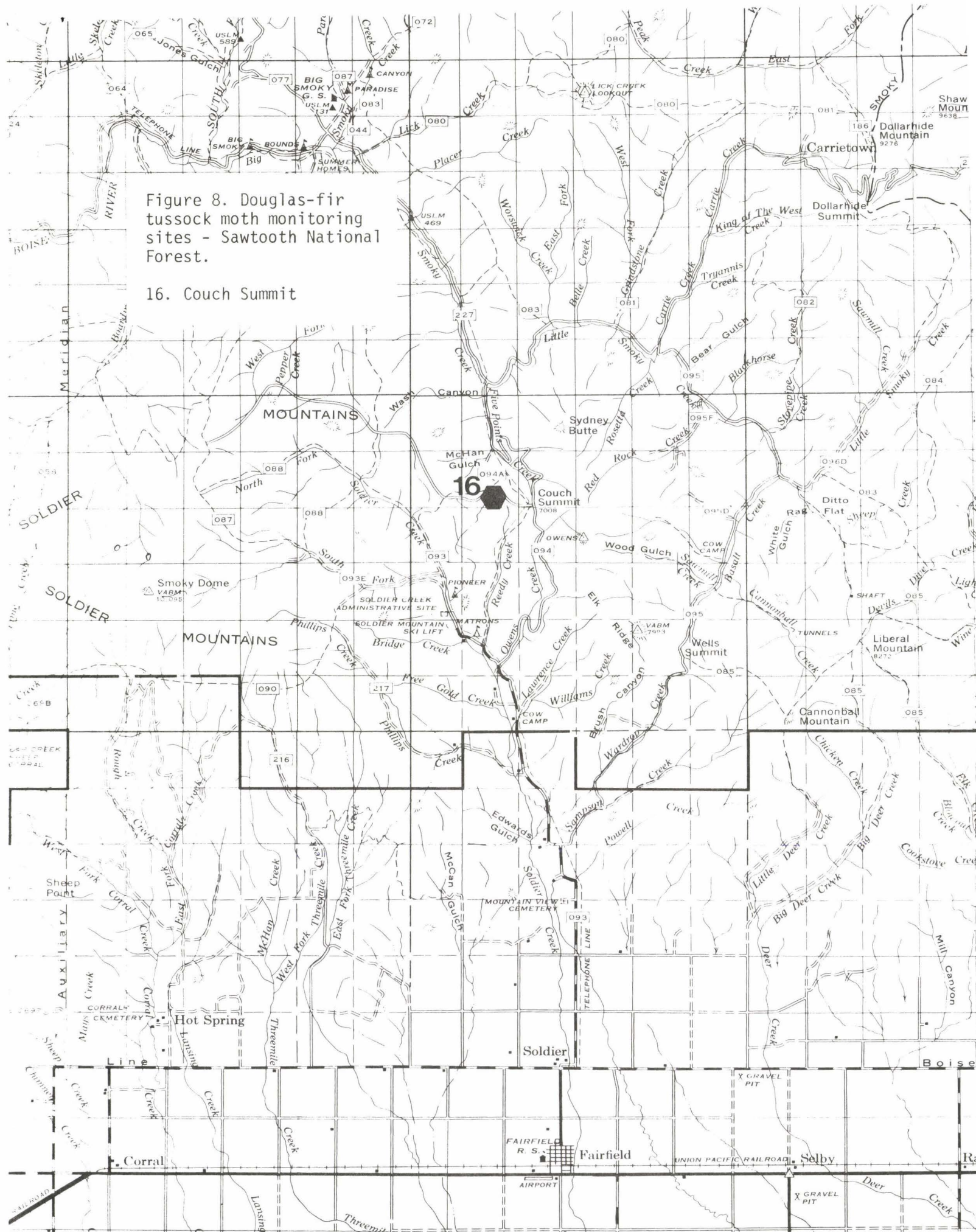
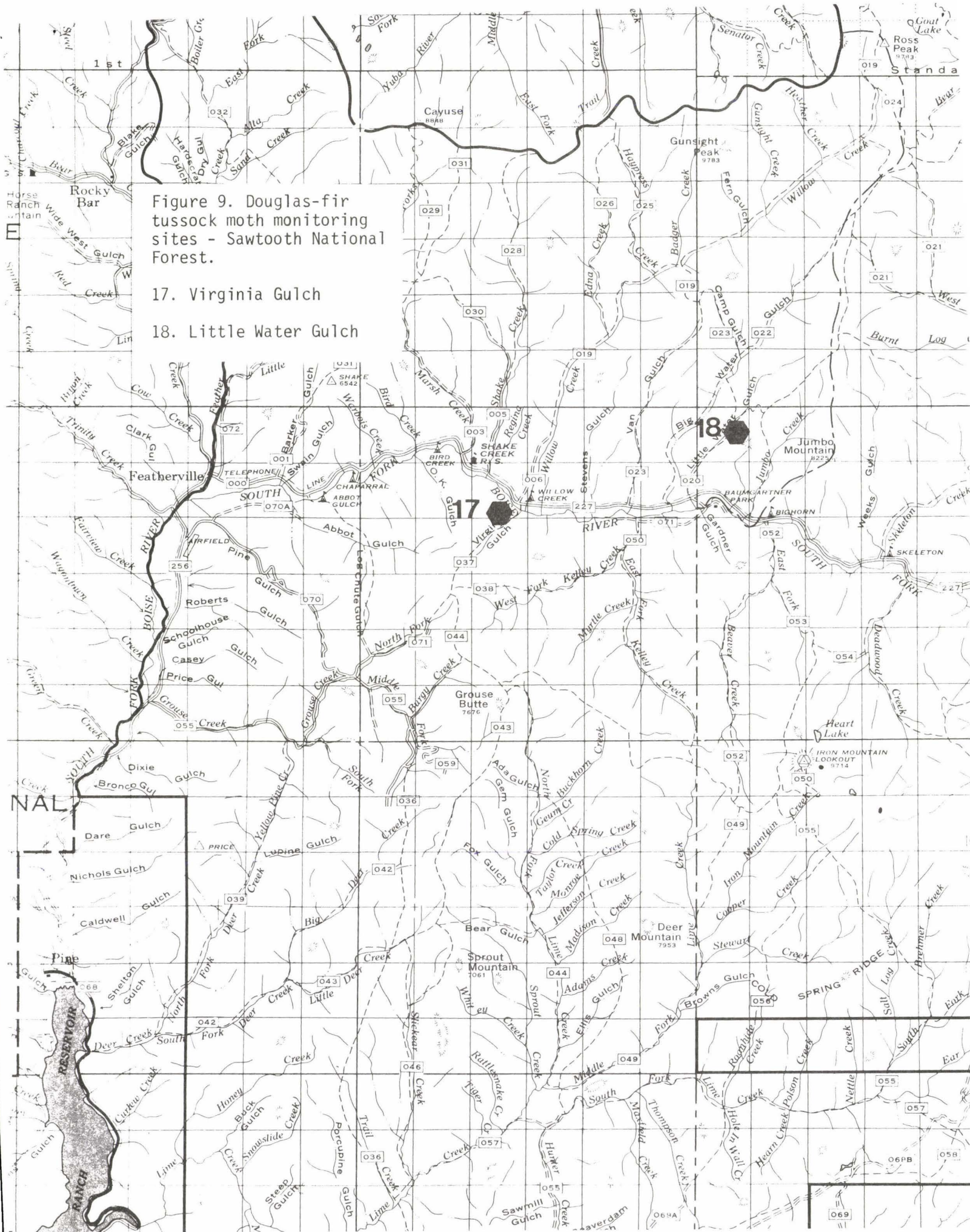


Figure 9. Douglas-fir tussock moth monitoring sites - Sawtooth National Forest.

17. Virginia Gulch

18. Little Water Gulch



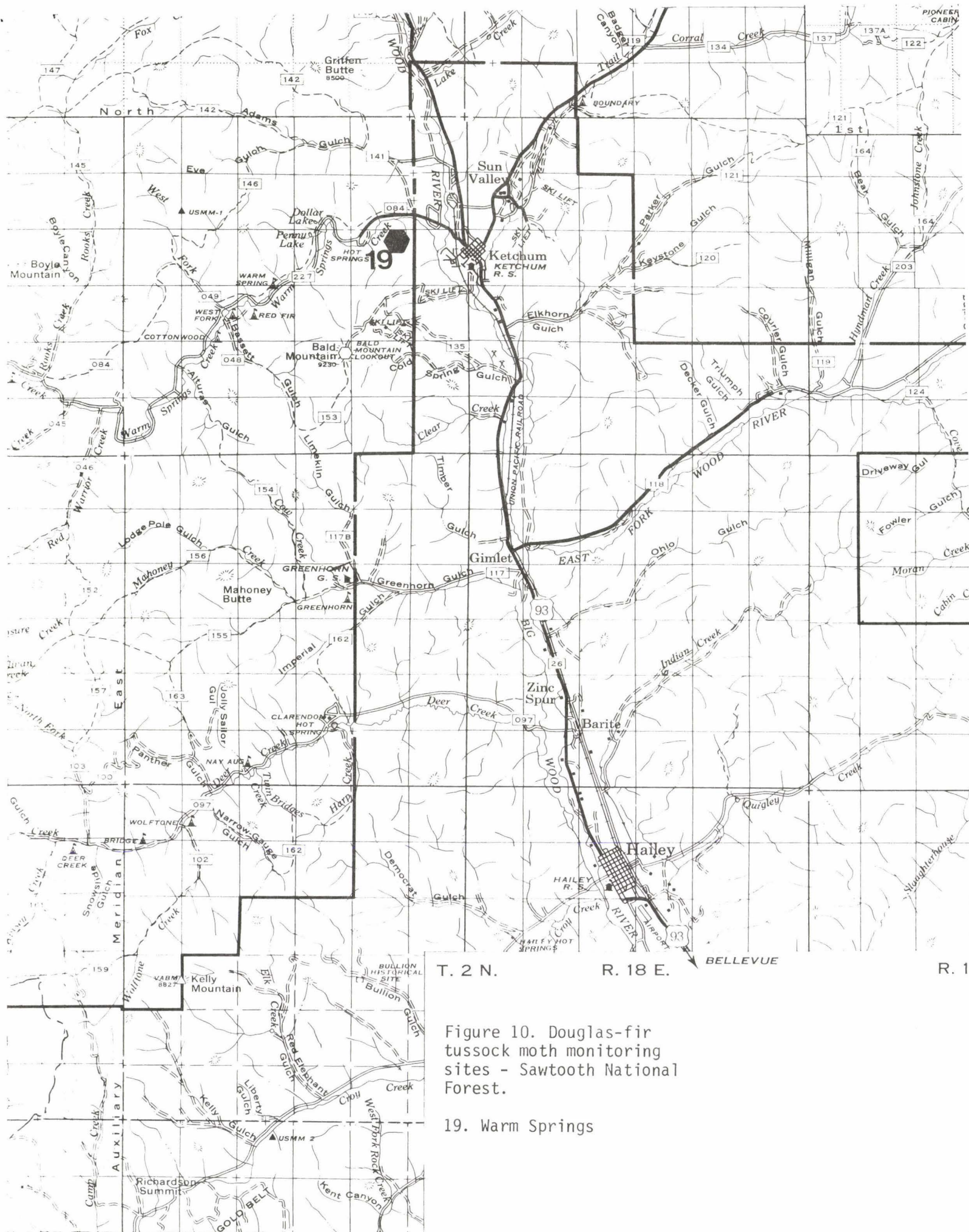


Figure 10. Douglas-fir tussock moth monitoring sites - Sawtooth National Forest.

19. Warm Springs

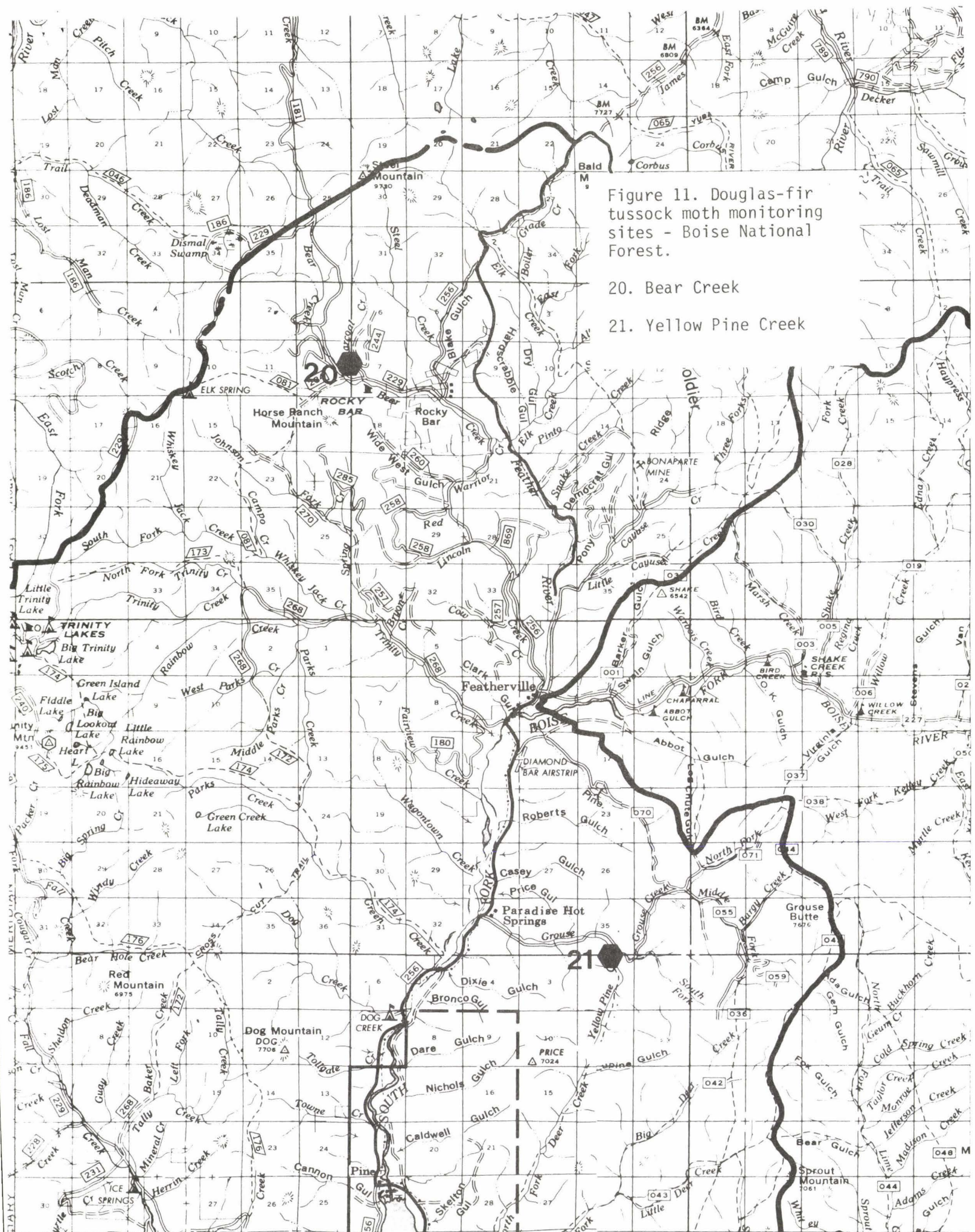


Figure 11. Douglas-fir tussock moth monitoring sites - Boise National Forest.

- 20. Bear Creek
- 21. Yellow Pine Creek

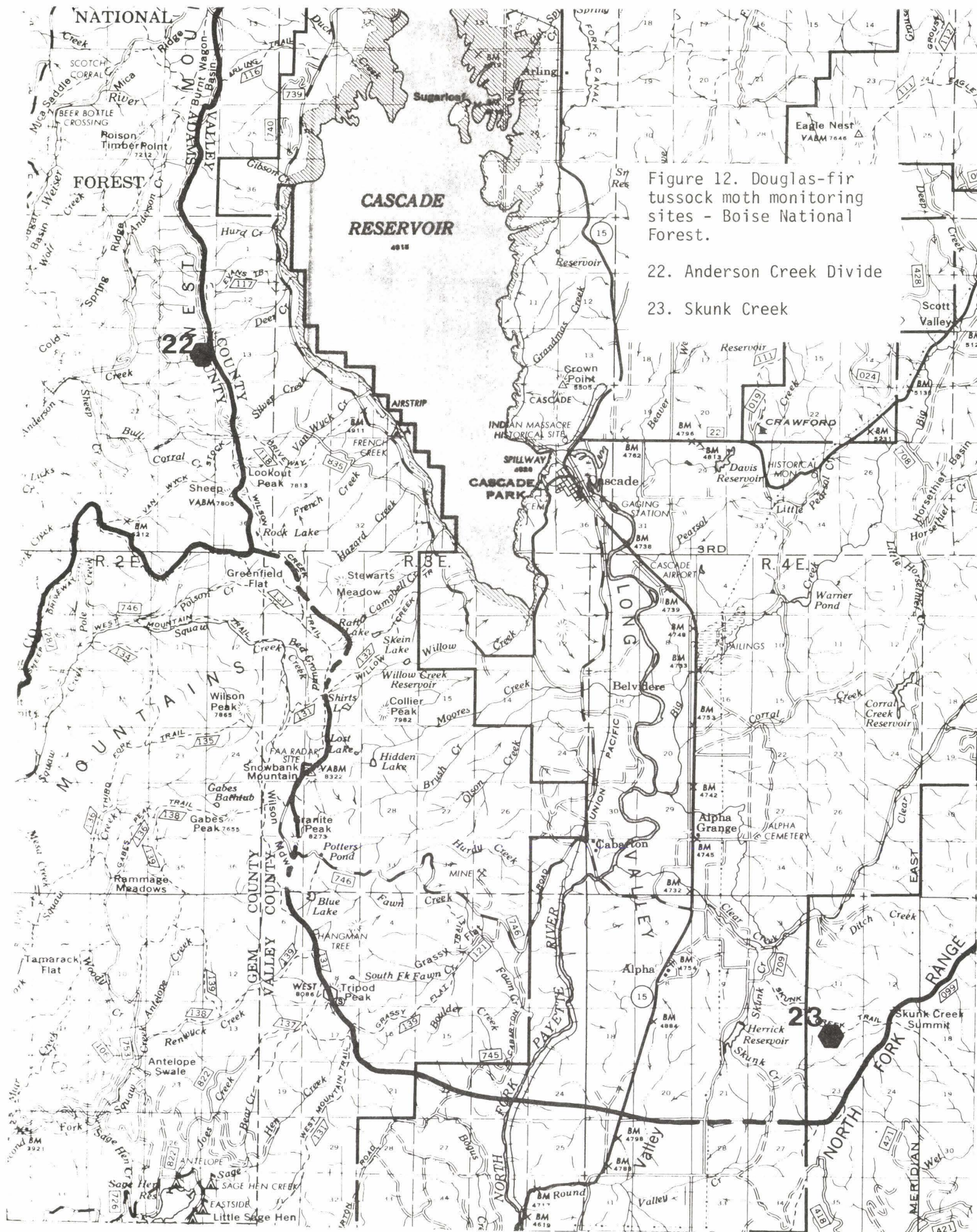


Figure 12. Douglas-fir tussock moth monitoring sites - Boise National Forest.

22. Anderson Creek Divide

23. Skunk Creek

Figure 13. Defoliation by Douglas-fir tussock moth and early detection survey sites in southern Idaho.

